

Travelling waves for the higher order autocatalytic reaction-diffusion systems

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ABSTRACT

We discuss the existence of travelling waves and their propagation speeds for the reaction-diffusion model with the higher order autocatalytic reaction terms, which also may be regarded as a predator-prey interaction terms:

$$\begin{cases} u_t = du_{xx} - uv^m, \\ v_t = v_{xx} + uv^m, \end{cases}$$

where u and v are concentrations of the reactant and the autocatalyst respectively. The order of autocatalytic reaction is assumed to be greater than or equal to cubic, that is, $m \geq 2$. We first consider the two extreme cases: $d = 1$, and $d = 0$. For such cases, the corresponding travelling wave equations are reduced to the 2-component first order systems which can be analyzed by the elementary phase plane analysis. Then, we investigate the case $0 < d < 1$. For all cases, we try to estimate the propagation speeds of travelling waves through the parameters m and d .

Key Words: traveling waves, autocatalytic reaction, phase plane analysis

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